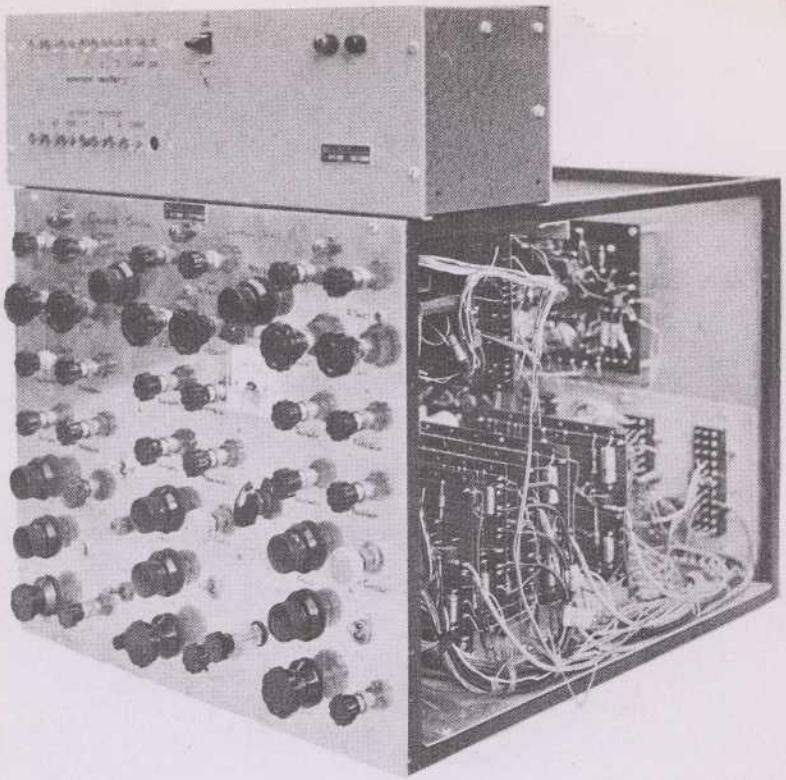

CQ-TV

no 60

The Journal of the British Amateur Television Club

THE BRITISH AMATEUR TELEVISION CLUB

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	S. Woodward G6AAZ/T	44 Winton Road, Reading, Berks.

GENERAL INFORMATION

Introduction.

The club was founded in 1949 to inform, instruct and co-ordinate the activities of amateur radio enthusiasts experimenting with television transmission, and to liaise with other enthusiasts engaged on similar work overseas. The club is affiliated to the Radio Society of Great Britain, and has a membership of over 800 at the present time. Of these, about one third reside abroad; in particular, there is much amateur activity in Australia, Canada, France, the Netherlands, and the U.S.A.

Experiments carried out by BATC members have been mainly in two directions: R.F. and video. As few members have the resources to build both sorts of equipment, many have combined to form constructional groups, to hold lectures, and to take part in local exhibitions. There are local groups of this type in various places. The Hon. Secretary will be pleased to let you know the names and addresses of members in your district.

Club Standards.

On the video side, the standards recommended are such that a normal domestic TV set can be used as a monitor, with waveforms similar to BBC-ITA. For interchangeability, members are recommended to arrange all video outputs at the one volt level, whites positive syncs negative; pulses at the two volt level negative going with all signals at 75 ohm impedance. Belling-Lee plugs and sockets are preferred.

Slow-Scan Picture Transmission.

Another branch of the hobby has become popular: slow-scan television. The line and frame rates (25 c/s and one frame in 5 seconds) are sufficiently slow to permit pictures to be tape-recorded or transmitted, using band widths of the order of three or four kc/s only.

Transmitting Licence.

On the radio side, the experimenter must hold a GPO amateur vision licence, costing £2 per annum, but not requiring a knowledge of morse. Operation is permitted in the 70 cm band and on shorter wavelengths. Full details can be obtained from the GPO Radio Branch, St. Martins le Grand, London, E.C.1.

Camera Tubes.

Vidicon camera tubes, rejected by the manufacturers for minor blemishes are available to Club members for a nominal price and can be sent to any part of the world. Reject monoscopes are available in the U.K. only for £7.10s. information on the procedure for ordering a tube, and for ordering vidicon scan and focus coils can be obtained from the Hon. Secretary.

MODULATOR

A TRANSISTOR MODULATOR

The Modulator to be described is used to control grid modulate a 4 x 150 but is also suitable for use with QQV06-40A and QQV03-20A valves.

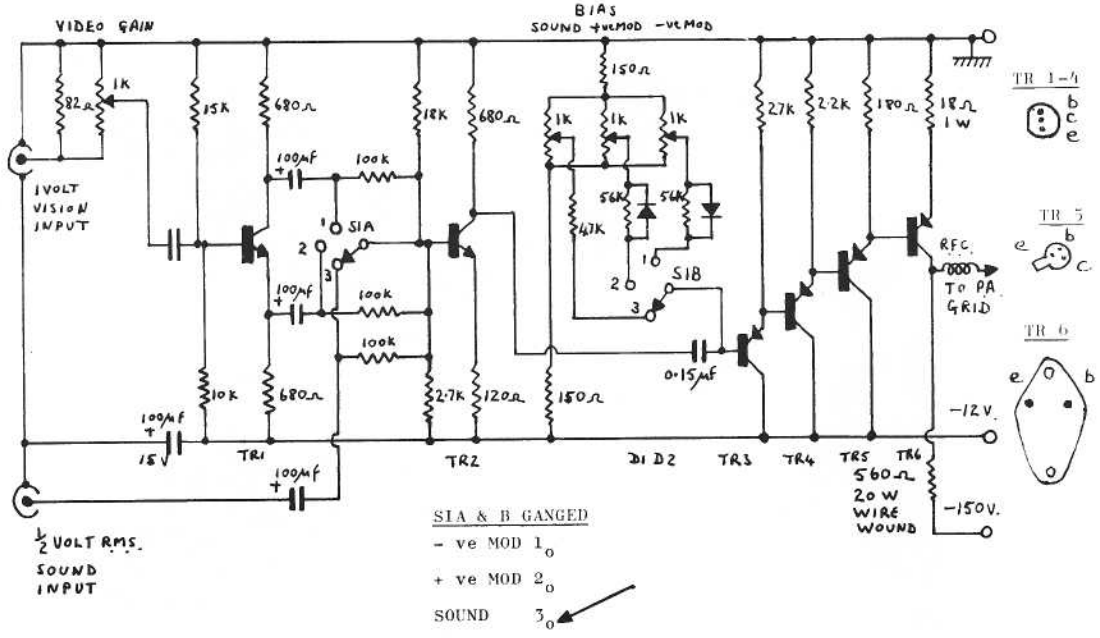
With the advent of cheap high voltage, high power, high frequency P.N.P. transistors, the writer decided to investigate the possibility of using such transistors in a transmitter modulator. The result was a modulator that was much smaller and easier to build, required less power and with a performance better than the valve modulator it replaced. The cost of the parts was also quite low, even the high voltage output transistor 2N3730 was only 9/6d.

CIRCUIT

The first stage in the modulator is a unity gain phase splitter, so that positive or negative modulation can be used at the turn of a switch. This is followed by an amplifier with a gain of about 5. This feeds the 2 d.c. restorers which are switched out of circuit for sound modulation. The chain of emitter followers feeding the output transistor is necessary to present a high impedance load to the d.c. restorers.

The whole modulator is mounted in a box very close to the P.A. stage in the transmitter, see photograph, but screened from it. This is so that the wire connecting TR6 to the grid of the P.A. is only about 3 inches long, thus keeping stray capacitance as low as possible.

The power supplies required are - 150V regulated at 150mA max. and - 12V regulated at 250mA max.



For the sake of simplicity, peak white strech and sync strech circuits have been omitted. With the 4 x 150 these are not really necessary and with the other valves, if the input signal sync amplitude is increased to 0.4 volts, this is usually adequote for positive modulation.

TRANSISTORS

Almost any silicon N.P.N. transistor will do for TR1 and TR2
TR3 and TR4 P.N.P. Silicon (Henrys)
TR5 High Current P.N.P. Silicon (D.T.V.)
TR6 High Voltage P.N.P. Germanium (R.C.A.)

Transistors suitable for TR6 are:-
2N3730 10 watts 200 volts
2N3731 10 watts 320 volts.

CONSTRUCTION

With the exception of the output transistor all the components are mounted on a piece of Veroboard. TR5 is a TO5 transistor and must be fitted with one of the corrugated push on heat sinks. In order to keep the output capacitance as low as possible TR6 is mounted directly on to an aluminium heat sink of about 2 x 2 inches which is spaced from the chasis with stand off insulators. As the dissipation of this heat sink is not adequate a small sniff of air was taken from the 4 x 150 blower via a piece of $\frac{3}{8}$ inch tubing and the resulting air stream directed at the TR6 heat sink.

RESULTS

The bandwidth of the modulator is such that the 3MHz definition bars on a 405 test card C are clearly seen off air. For 625 line working it may be necessary to have a small H.F. peaking capacitor across the 120 ohm emitter resistor of TR2 although this has not been tried.

The modulator was developed in conjunction with John Ware G6RSA/T who has been using it on the air for about 6 months.

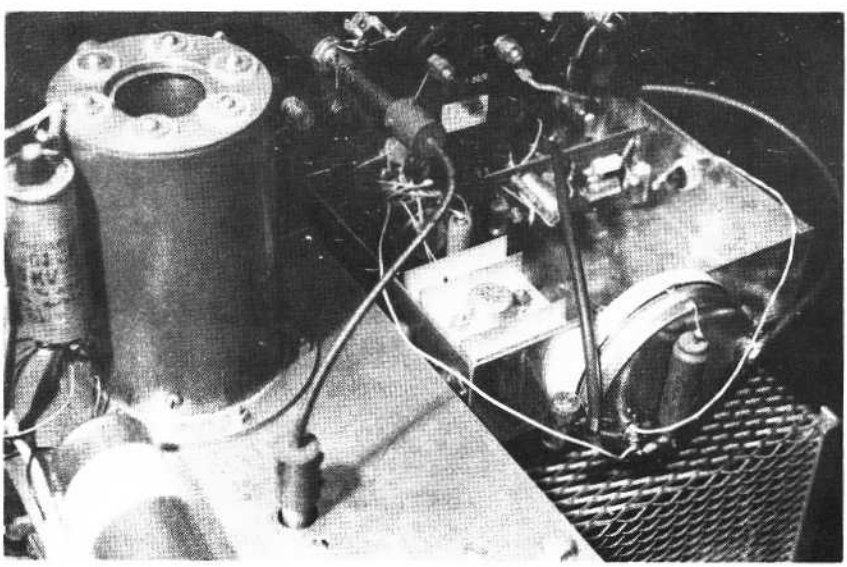
D. Mann
G6OUO/T

DIODES OA81 etc.

RESISTORS $\frac{1}{4}$W EXCEPT 18Ω AND 560Ω

	TEXAS	S.G.S.	R.C.A.
TR 1	2N3704	2N706,C111	-
TR 2	2N3704	2N706,C111	-
TR 3	2N3702	-	-
TR 4	2N3702	-	-
TR 5	-	V 410	40319,40362
TR 6	-	-	2N3730,2N3731

The output transistor can be seen on the heat sink close to the coaxial assembly containing the 4 x 150. The circular tin provides screening for a microphone amplifier.



Colour Bar Generator

A COLOUR BAR GENERATOR

The circuit is based on a design by John Lawrence GW6JGA/T which appeared in Practical Television February 1965. This generator is a transistorised 625 line version of the original. It consists of three monostable multivibrators, each giving an output waveform and requires a feed of line blanking pulses to initiate the switching sequence.

CONSTRUCTION

The construction is on plain Veroboard and is arranged to fit, together with other boards, into a plug in framework. For the transistors, an unmarked silicon N.P.N. type was used having a cut off frequency of about 200 MHz (i.e. 2N706, BSY27), but any fast switching type will work. If P.N.P. transistors are used, all the waveforms will be inverted and of course the diodes will need reversing.

CIRCUIT

Fig. 1. shows the switching circuit consisting of three monostable multivibrators with the diodes arranged to provide sequential triggering and the input stage which produces the trigger pulse for the first multivibrator from the trailing edge of line blanking. If difficulty is found in getting each monostable to fire, the time constants of the diode circuits may require adjustment. The only difficulty experienced was with the Blue generator. It was found necessary to reduce the value of the emitter resistor, R3 to obtain correct operation.

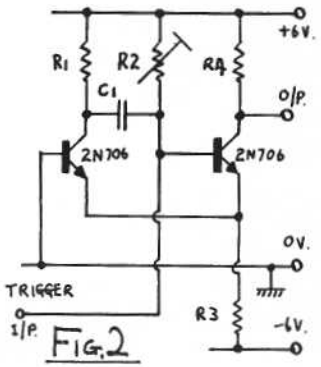


FIG. 2

Fig. 2 shows the monostable circuit which gives positive going pulses at the output and requires a negative going edge for triggering.

The pulse widths from the three generators for 405 and 625 line standard are approximately as follows:-

	405	625
Blue	10µS	6.5µS
Red	20µS	13µS
Green	40µS	26µS

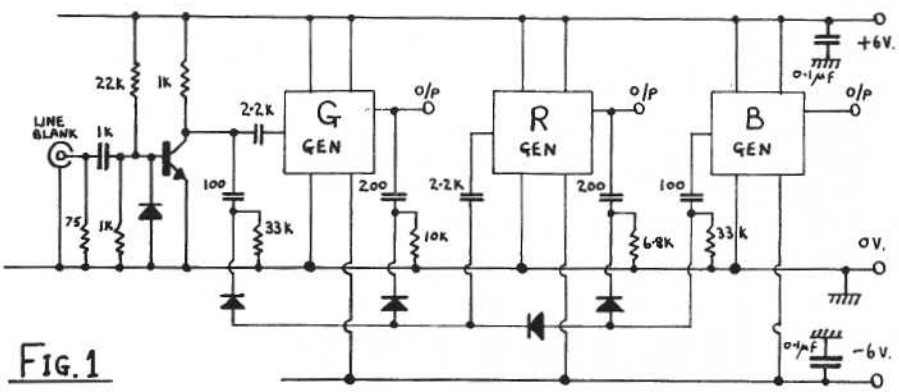


FIG. 1

DIODES OA5 CAPACITORS in pF RESISTORS in OHMS.

VALUES FOR 625 LINES

	R	G	B
R_1	1K	1K	1K
R_2	10K	10K	10K
R_3	1K	1K	500 ohms
R_4	1K	1K	1K
C_1	5500pF	2000pF	1000pF

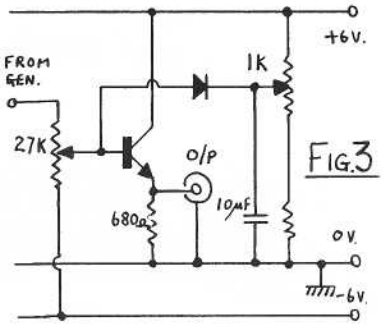


FIG.3

Figure 3 shows the output clipping circuit used with each of the three generators. The negative part of the pulse waveform is clipped by the transistor which cuts off at a given point, as set by the 27K ohm variable resistor. The 1 K ohm variable resistor is adjusted so that the diode conducts on the positive parts of the pulse waveform. These two controls should be set to give an output waveform of 1 volt peak to peak.

Figure 4 shows the switching sequence of the multivibrators in relation to line blanking. Line blanking is differentiated and clipped and the resultant pulse is amplified and inverted by TR_1 (Fig.1) to give a negative going edge coincident with the trailing edge of line blanking. This edge is passed via the diodes to all three generators which then turn on. The outputs from the generators when turned on are positive. The time constant of the Blue generator is the shortest, 6.5 μS and so 6.5 μS after the triggering edge, the Blue waveform returns to 0 volts. Next the Red generator turns off after 13μS, but the negative going edge of the Red waveform is differentiated and used to retrigger the Blue generator. Blue turns off after a further pulse of 6.5μS. After 26μS from the trigger pulse

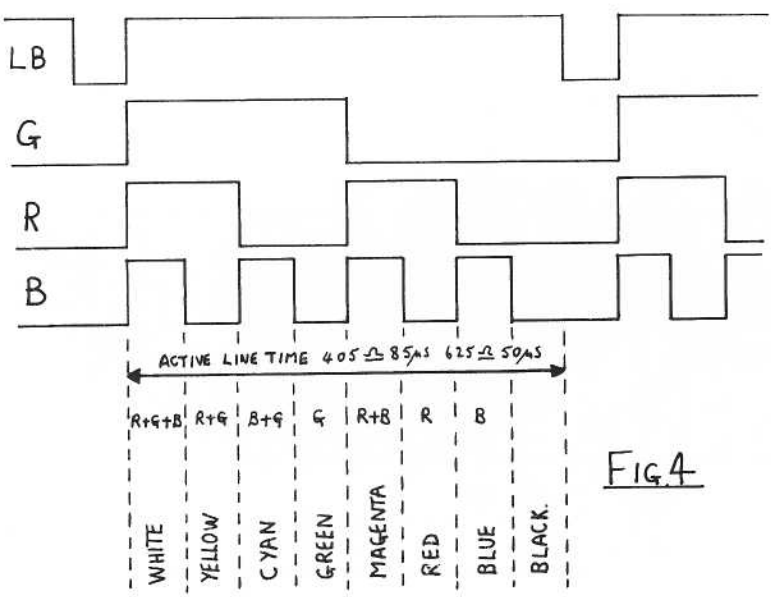


FIG.4

derived from line blanking, the Green generator turns off and in doing so the negative going edge is used, after differentiation, to retrigger both the Blue and Red generators. The Red waveform returns to the off condition after 13µS and triggers the Blue generator once more. This sequence is over before the end of active picture time and so there is a period when all three generators are off, giving a black signal.

These three output waveforms may be used with a suitable encoder for Field Sequential, P.A.L. N.T.S.C. S.E.C.A.M. N.I.R. etc., or directly on a R.G.B. input monitor.

If the power supplies are dry batteries, there may be some ringing introduced on the supply lines if precautions are not taken to adequotely decouple these. The ringing may give spurious triggering in a bad case.

M. BUES
G6OPB/T

postbag

Robert W. Preston W9JEE writes to tell us that a friend Rowland Oberg W9ZKQ has moved to England and that Rowland was very active in Amateur Television back in the States.
Rowland's address is:-
Rowland Oberg W9ZKQ,
10, Savernake Court,
Wolverton Road,
Stanmore, Middlesex.

A. Day of 18, Mentmore Road, Booker Hill, High Wycombe, Bucks, had instant success in re-tuning a U.H.F. tuner to cover 70 cms. He uses a 64 element collinear array and is prepared to send reports to interested stations.

William Blewitt is busy collecting the necessary parts to construct a vidicon camera for closed circuit use.

John Gould is now licenced G6ACD/T, congratulations! John's Q.T.H. is in Tunbridge Wells. He has been a keen listner on 70 cms., both sound and vision and has heard over 8 counties using a turnable converter into a domestic T.V. receiver with 2 AF139 pre-amplifiers. The aerials used vary between a helix and a home-made 10 element yagi. Good pictures have been received from G6SSE/T and G6NTT/T.

John's transmitter uses a QQV02-6 tripler driving a QQV02-6 P.A.

Vision equipment consists of a pulse generator using multivibrators as counters and a flying spot camera suitable for slides. John is active most weekends from his home Q.T.H.

David G3PTU is now operational on 437.45 MHz 405 lines under the call G6ACH/T using a flying spot scanner and 15 watts input to a QQV03-20A power-tripler. David's signals have been received by G3VGH and G3UUJ both in York.

B. Senior of 1, Bedale Close, Coalville, Leicester has got a flying spot scanner and transistorised vidicon camera working on 405 lines and now has received equipment for 420 to 450 MHz. He would like to hear from any nearby B.A.T.C. types.

Charles Richardson BRS 25592 is building two 405/525/625 monitors and organising a receiver for 70 cms. In the future is the construction of the transistorised S.P.G. by Mike Cox and a vidicon camera. For an aerial Charles will be using a 10 element yagi at about 50 feet above ground level.

Grant Dixon

UNIJUNCTION

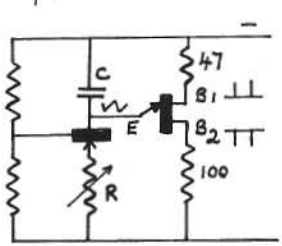
A NEW DIVIDER CIRCUIT USING UNIJUNCTIONS

The UNIJUNCTION TRANSISTOR or UJT is a device which has two base connections and one emitter. B_1 is usually connected to the negative rail and B_2 to the positive rail with current limiting resistors in each case. The UJT normally possesses a high resistance, but if the emitter potential is gradually increased from the potential of the negative rail, it will reach a critical value where the UJT conducts and its resistance then falls to a very low value. As an example, refer to fig. 1. ..... the capacitor C is charged by the collector current of the transistor, the rate of charge being controlled by R. When the potential cross C reaches the critical value, the UJT conducts and discharges the capacitor. The waveforms for the circuit are as show in the figure. This circuit will give a very good linear sawtooth for use in timebases.

If we now modify the circuit by feeding pulses into the transistor, we have a step counter as shown in fig. 2. The count ratio is governed by the values of C and R, and counts of 20, 30 or 40 are easily possible, but for reliability it is better not to exceed 10 or 12 steps unless supplies are fully regulated. When it is desired to cascade several stages the following points should be borne in mind .....

1. At the higher frequencies, if C is large it may not be fully discharged before the next pulse starts charging again, this gives a confusing waveform.
2. The output pulse at B_2 has a width which is determined by the value of C and the discharge resistance through the UJT.
3. As we progress to lower frequencies, it is impossible to increase the width of the output pulse by increasing the value of the capacitor, as by doing this we need larger input pulses to give the same count ratio.
4. As the final 50 cycle output pulse is so narrow it is necessary to use it as a trigger for a 'wide-pulse generator' to give the gating pulses needed in the feed-back loop.

Fig.1.



2N2160
or 2N2646

Fig.2.

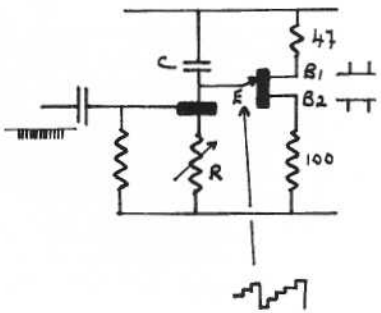
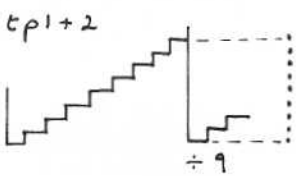
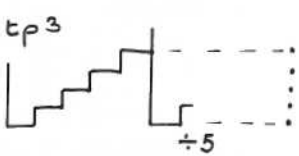
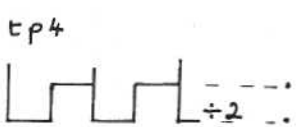


Fig 4





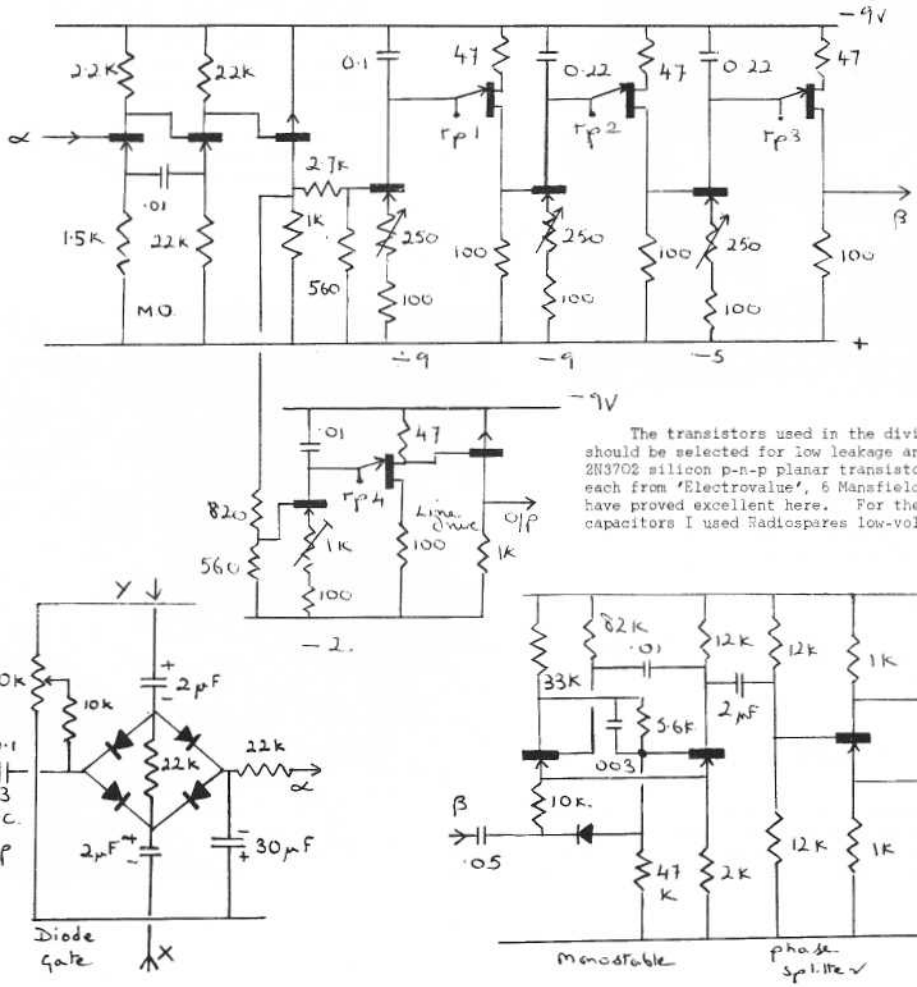


The final circuit for a 405-line counter is shown in fig. 3. The master oscillator uses two GET43 (10/- dozen from Hon.Sec!) and this is followed by an n-p-n buffer stage. One UJT divider stage is used to give the line frequency, and three more UJT divider stages give the 50 cycle trigger pulse just mentioned. There follows a monostable 'wide-pulse generator' and a phase splitter which feeds back to the 4-diode gate.

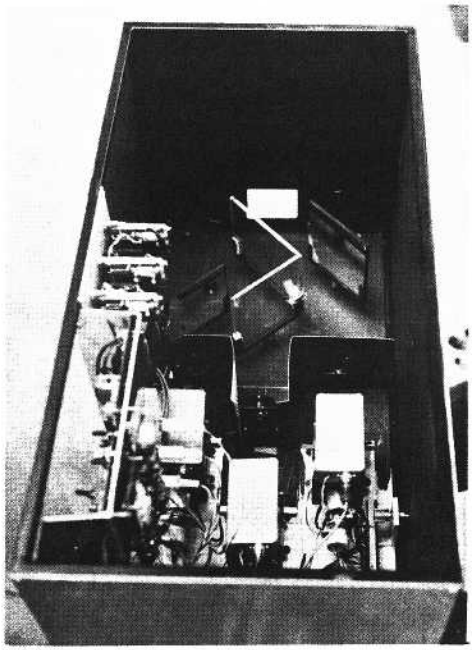
The waveforms at test points tp1 and tp2 are almost the same, but at tp1 the 'flyback' occupies a large portion of the first horizontal step. At tp3 there are only 5 steps and the adjustment is even less likely to go out of lock.

Finally, one or two comments for the constructor. This is not, of course, a complete pulse generator, but it is a complete timer unit and with the addition of sync. and blank pulse generators, pulse mixers etc. it should give a reliable, easily adjusted, pulse generator. The actual UJTs used were 2N2160 and 2N2646 ..... the former was an "International Rectifiers" one in a nice plastic pack carrying the wrong base connections!! Please note the correct ones .....

If the timebase of the scope is rendered inoperative, then the waveform is shown as a vertical line with a number of bright dots on it; the number of dots indicates the division ratio of the stage.



The transistors used in the divider stages should be selected for low leakage and high gain. 2N3702 silicon p-n-p planar transistors at 4/9 each from 'Electrovalue', 6 Mansfield Place, Ascot, have proved excellent here. For the charging capacitors I used Radiospares low-voltage discs.



This view shows Mike Cox's Colour Camera with the top cover removed. The three vidicon assemblies each with its head amplifier in a small Eddistone box may be seen at the bottom.

Light from the scene enters the camera through the rectangular hole and is analysed by the filters and mirrors into the three components red, green and blue and directed through the three lenses to the vidicon tubes.

COVER PHOTO

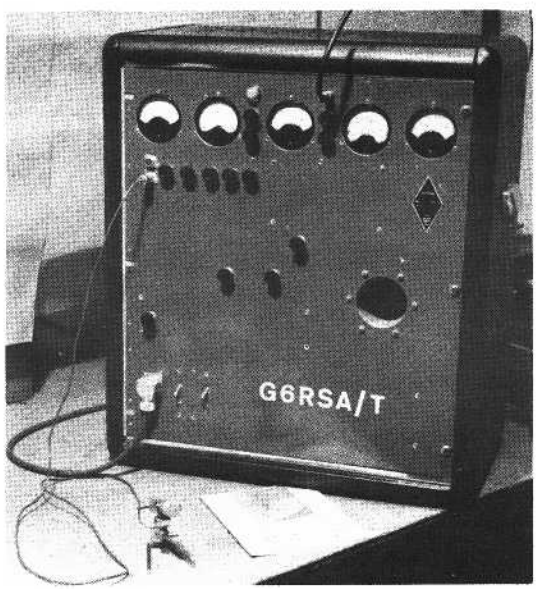
The construction of the Camera Control unit can be seen in this view showing the use of Veroboard. Note the symetrical layout of the controls for the three tubes.

NRSA CONVENTION AND EXHIBITION BELL VIEW MANCHESTER

The B.A.T.C. was again represented at this event by several members under the guidance of Gordon Sharply G6LEE/T. On the stand was a vidicon camera with a four lens Turret displaying the various interesting scenes on a 14" monitor. A flying spot scanner was used for captions.

John Ware G6RSA/T sent us this photograph of his transmitter. It has a 4 x 150 valve as the final amplifier with an input power of 150 watts and can be modulated with audio or video in a positive or negative sence on 405 or 625 lines. The modulator is transistorised and is described in this journel.

John is at present erecting a new aerial installation which uses 2 parabeam aerials stacked to give a gain of 20dB.



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CQ-TV

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